

Pick and Eat Crop Testing: Dwarf Tomato and Pepper as Candidate Space Crops

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ABSTRACT

Several dwarf tomato and pepper varieties were evaluated under ISS-simulated growth conditions (22°C, 50% RH, 1500 ppm CO₂, and 300 $\mu\text{mol m}^{-2} \text{s}^{-1}$ of light for 16 h per day) with the goal of selecting those with the best growth, nutrition, and organoleptic potential for use in a pick and eat salad crop system on ISS and future exploration flights. Testing included six cultivars of tomato (Red Robin, Scarlet Sweet 'N' Neat, Tiny Tim, Mohamed, Patio Princess, and Tumbler) and six cultivars of pepper (Red Skin, Fruit Basket, Cajun Belle, Chablis, Sweet Pickle, and Pompeii). Plants were grown to an age sufficient to produce fruit (up to 106 days for tomato and 109 days for pepper) using Turface (arcillite) potting media with 18-6-8 control-release fertilizer and supplemental nutrient solution beginning ca. 60-days-age. Tomato fruits were harvested when they showed full red color, beginning ca. 70-days age and then at weekly intervals thereafter, while peppers were grown until fruits showed color and were harvested twice (first test) and just once at the end of the second test, with the final harvests including colored and green fruit. Plant sizes, yields, and nutritional attributes were measured and used to down-select to three cultivars for each species. In particular, we were interested in cultivars that were short (dwarf) but still produced high yields. Nutritional data included elemental (Ca, Mg, Fe, and K) content, vitamin K, phenolics, lycopene (for tomato), anthocyanin, lutein, and zeaxanthin. The three down-selected cultivars for each species were grown again and the harvested fruit sent to NASA's Johnson Space Center for sensory evaluation, which included overall acceptability, appearance, color intensity, aroma, flavor and texture. The combined data were compared and given weighting factors to rank the cultivars as candidates for testing in space. Weightings gave maximum importance to plant size (smaller being good) and fruit yield (greater yields being good). For tomato, the ranking was 1) cv. Mohamed and cv. Red Robin (tied), and 3) cv. Sweet N' Neat. For pepper, the ranking was 1) cv. Pompeii, 2) cv. Red Skin, and 3) cv. Fruit Basket. These rankings are somewhat subjective but provide a starting point for conducting higher fidelity testing with these crops (e.g., testing with LED lighting similar to the Veggie plant unit on ISS), and ultimately conducting a flight experiment.



Fig. 1. Dwarf tomato plants growing in a plant growth chamber (L) and a dwarf pepper plant with mature fruit (R)